Assembly Model

Application Resource Model for Mechanical Assembly

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ASSEMBLY MODEL

Scope

The followings are within the scope of this part of ISO 10303.

- the connecting associations among the components constituting a assembled product;
- the associations among the components which are not physically connected;
- the relationships among the associations of the components;
- the description of the product composed of both the designed components and the standard components;
- the characteristic features of the associations among the components;
- the design, the analysis and the manufacturing preparation of the assembled products;

The following are outside of the scope of this part of ISO 10303

- the configuration management of the assemblies and the components;

Target Product

(1) Products composed of sets of components.
The products considered here are the assembled products composed of sets of the components. The whole products are called "assemblies", and the components of the lowest levels in the assemblies are called "parts". The components of the intermediate levels are named “sub-assemblies”.

(2) Product structure configuration of assembly
The objective of the assembly model is to establish a model describing both the product structure configuration and the connecting associations among the components needed in the various design, analysis and manufacturing process planning phases.

(3) Standard parts
The standard parts are basically divided into two; they are, the standard parts included in the parts catalogues discussed in ISO TC 184/SC4/WG2, and the standard parts defined by the users.

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Target Application Fields

(1) Kinematic analysis of mechanical assemblies
ISO 10303-105 Kinematics supports the kinematic analysis, however, Part 105 is not sufficient to integrate the 3D-CAD systems and the kinematic analysis systems.

(2) Animation of mechanical assemblies
The animation of mechanical assemblies is very important for future extension of the digital-mockup technologies.

(3) Assembly/disassembly process planning
The assembly process planning and the disassembly process planning are important application fields of the assembly model from the viewpoint of the integration of CAD and CAM systems.

(4) Tolerance analysis and synthesis
The tolerance analysis and synthesis of the complicated mechanical assembly are very important application fields of the assembly model.

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ASSEMBLY MODEL

International Cooperation

Mr. Len Slovensky (US)
Mr. Tony Fry (UK)
Prof. Guy Pierra (France)
Prof. Nobuhiro Sugimura(Japan)
Mr. Akihiko Ohtaka (Japan)
Prof. Hiroyuki Hiraoka
?? (Germany)
Others

Domestic Members

Prof. Nobuhiro Sugimura
Mr. Akihiko Ohtaka
Prof. Hiroyuki Hiraoke
and Others
(Total 10 including Users and Vendors)

Normative References

ISO 10303 Part 41 Fundamentals of Product Definition and Support
ISO 10303 Part 42 Geometric and Topological Representation
ISO 10303 Part 43 Representation Structure
ISO 10303 Part 44 Product Structure and Configuration
ISO 10303 Part 47 Shape Tolerance
ISO 10303 Part 49 Process structure and properties
ISO 10303 Part 105 Kinematics
ISO 13584 Standard Parts

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Contents of Assembly Model

(1) Information of individual parts.
(2) Information of standard parts.
(3) Structure configuration of assembly
  a) Hierarchical associations (parent-child associations) among assemblies, subassemblies and parts.
  b) Positions and orientations of components in a higher level component.
  c) Tolerance of the positions and orientations
(4) Component Association
  a) Peer to peer associations among components.
  b) Relative positions and orientations of components against other components.
  c) Relative motions of components against other components.
  d) Tolerance of the relative motions, positions and orientations.
  e) Assembly features needed to define technological information of component associations.

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STEP Parts related to Assembly Model

Information	STEP Model
(1), (3)-a), (3)-b)	ISO 10303: Part 41 : Fundamentals of Product Description and Support.
(1)	ISO 10303: Part 42 : Geometric and Topological Representation.
(3)-b)	ISO 10303: Part 43 : Representation Structures.
(3)-a), (3)-b), (4)-b)	ISO 10303: Part 44 : Product Structure Configuration.
(1)	ISO 10303: Part 45 : Materials.
(1), (3)-a), (3)-b)	ISO 10303: Part 46 : Visual Presentation.
(1)	ISO 10303: Part 47 : Shape Tolerances.
	ISO 10303: Part 49 : Process Structure and properties.
(1), (3)-a), (3)-b)	ISO 10303: Part 101: Draughting.
(1)	ISO 10303: Part 104: Finite Element Analysis.
(4)-a), b), c)	ISO 10303: Part 105: Kinematics.
(2)	ISO 13584: Standard Parts

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Contents of Assembly Model Considered in NWI

(4) Component Association
- a) Peer to peer associations among components.
- b) Relative positions and orientations of components against other components.
- c) Relative motions of components against other components.
- e) Assembly features needed to define technological information of component associations.

Following two items should be considered in another NWI

(3) Structure configuration of assembly
- c) Tolerance of the positions and orientations

(4) Component Association
- d) Tolerance of the relative motions, positions and orientations.

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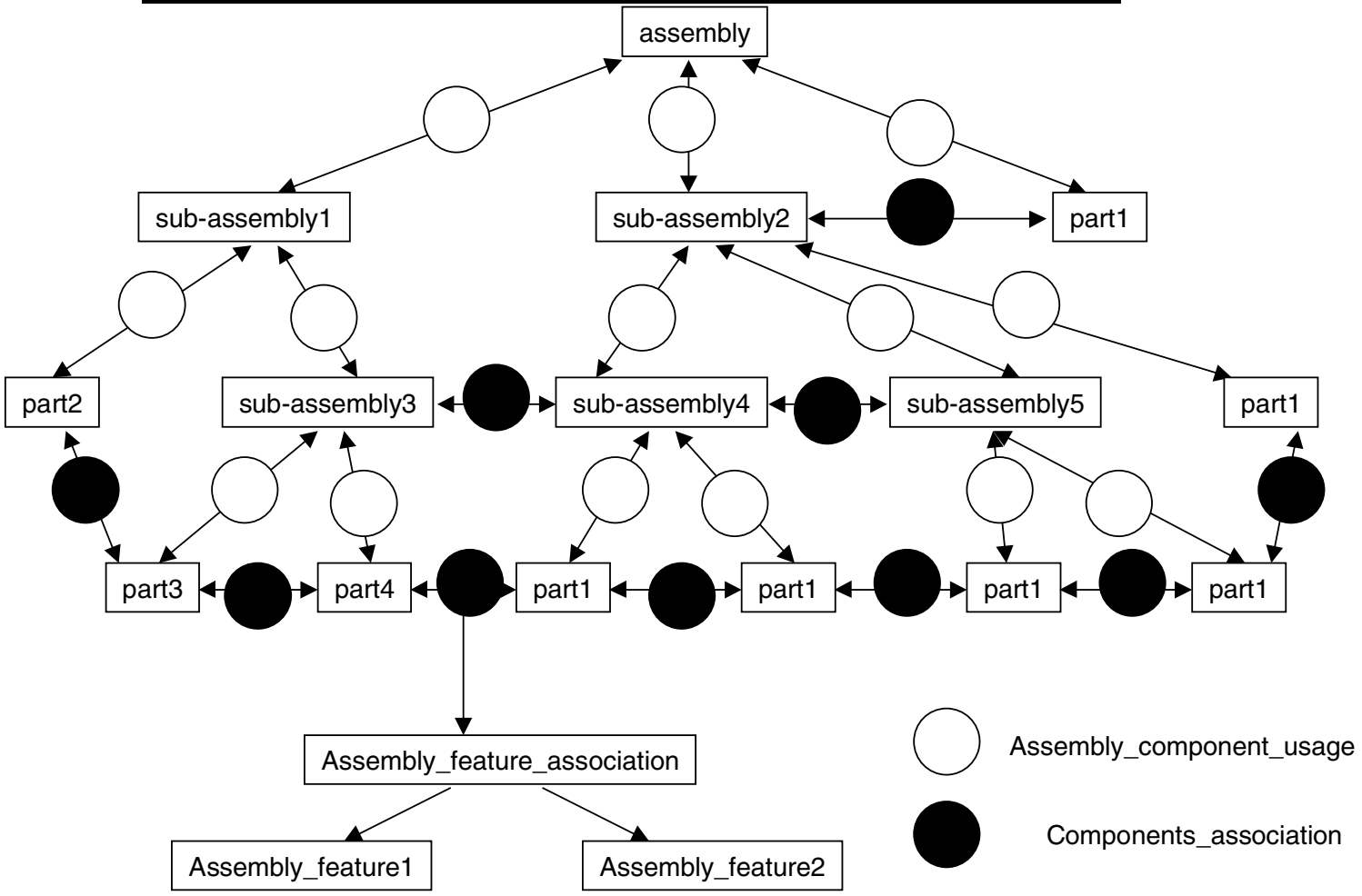
ASSEMBLY MODEL

Parent-Child Association and Peer-to-Peer Association of Assemblies
(Hierarchical Relations and Components Associations)

Assembly Model deals with Component Associations



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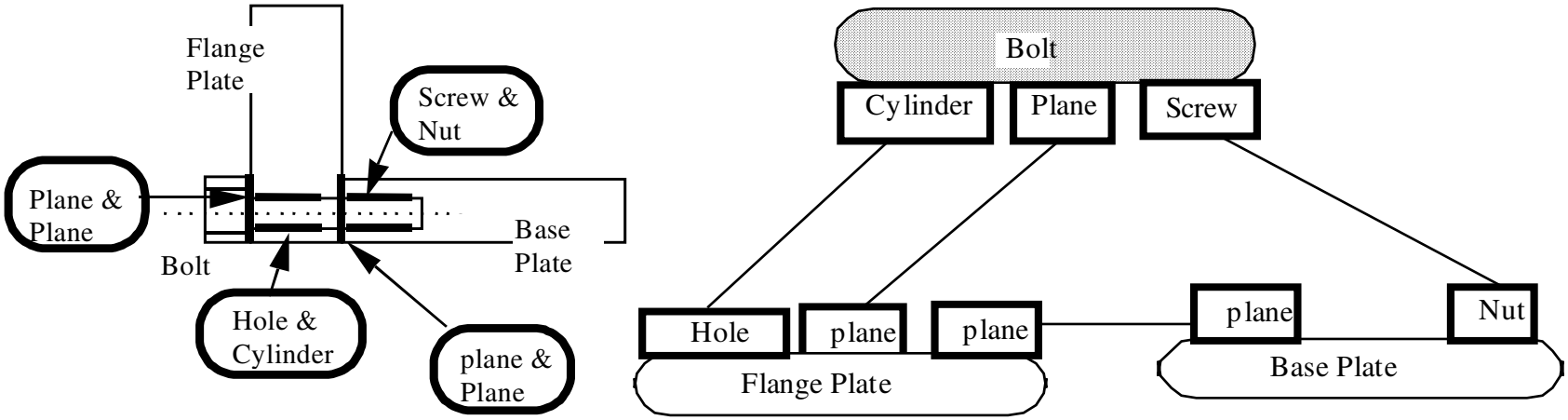
ASSEMBLY MODEL

Assembly Features

Elemental entities for representing the peer to peer associations between a pair of components.

Ex. Holes, Pegs, Gears, Guides, Cams, Screws, Plane Faces
Center lines, Plane Surfaces, Points



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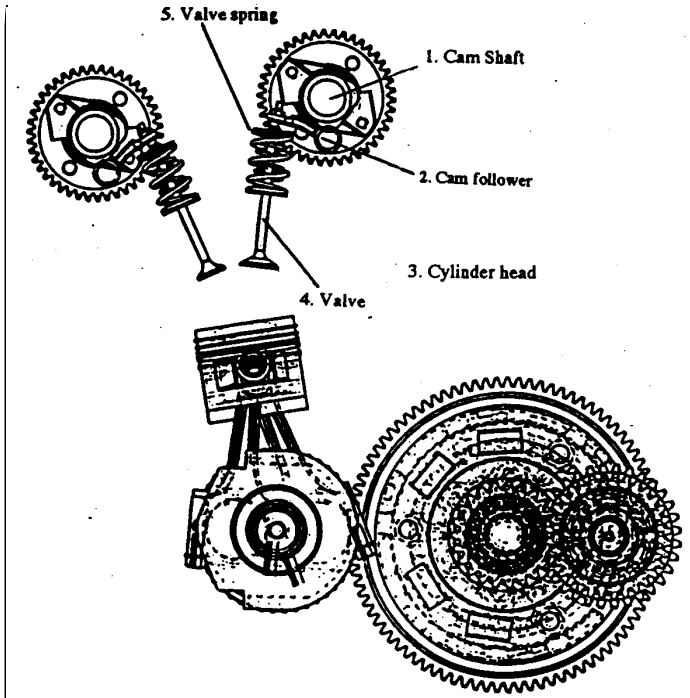
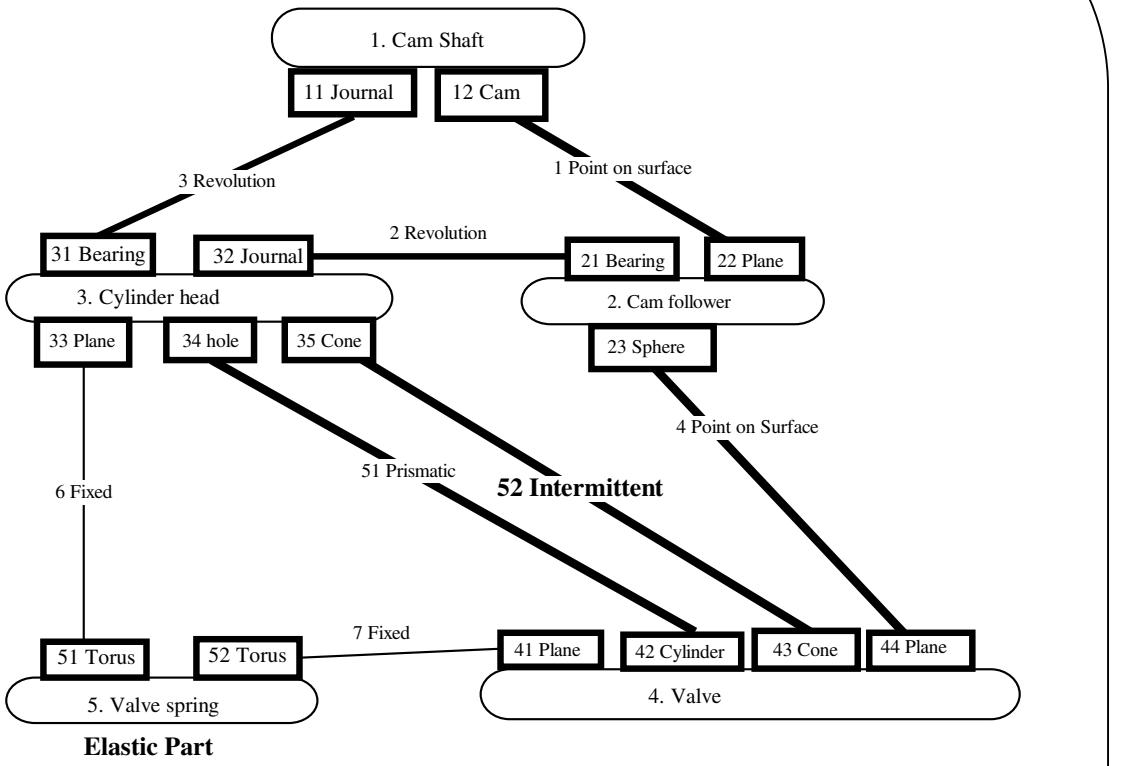
ASSEMBLY MODEL





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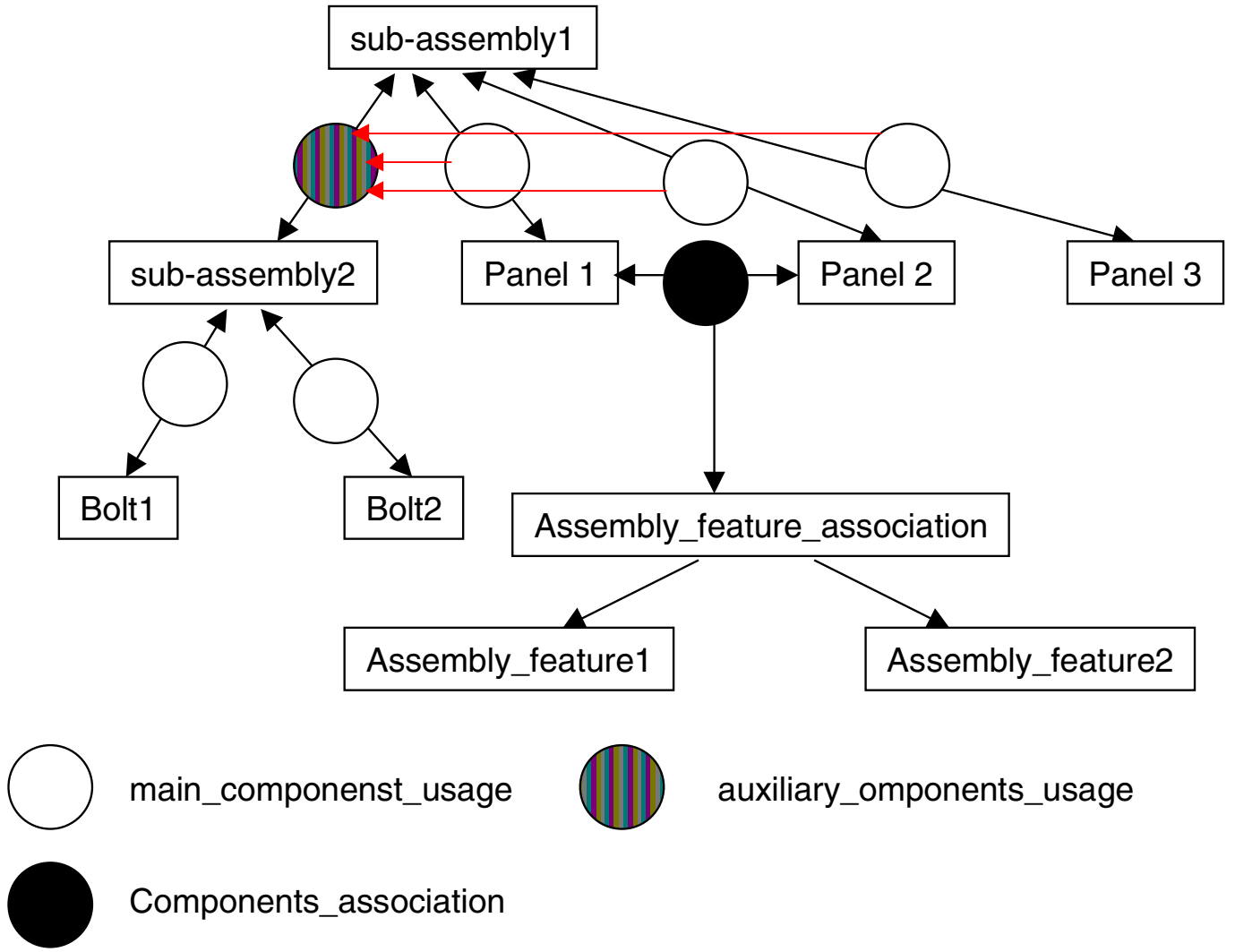
Main Components and Auxiliary Components



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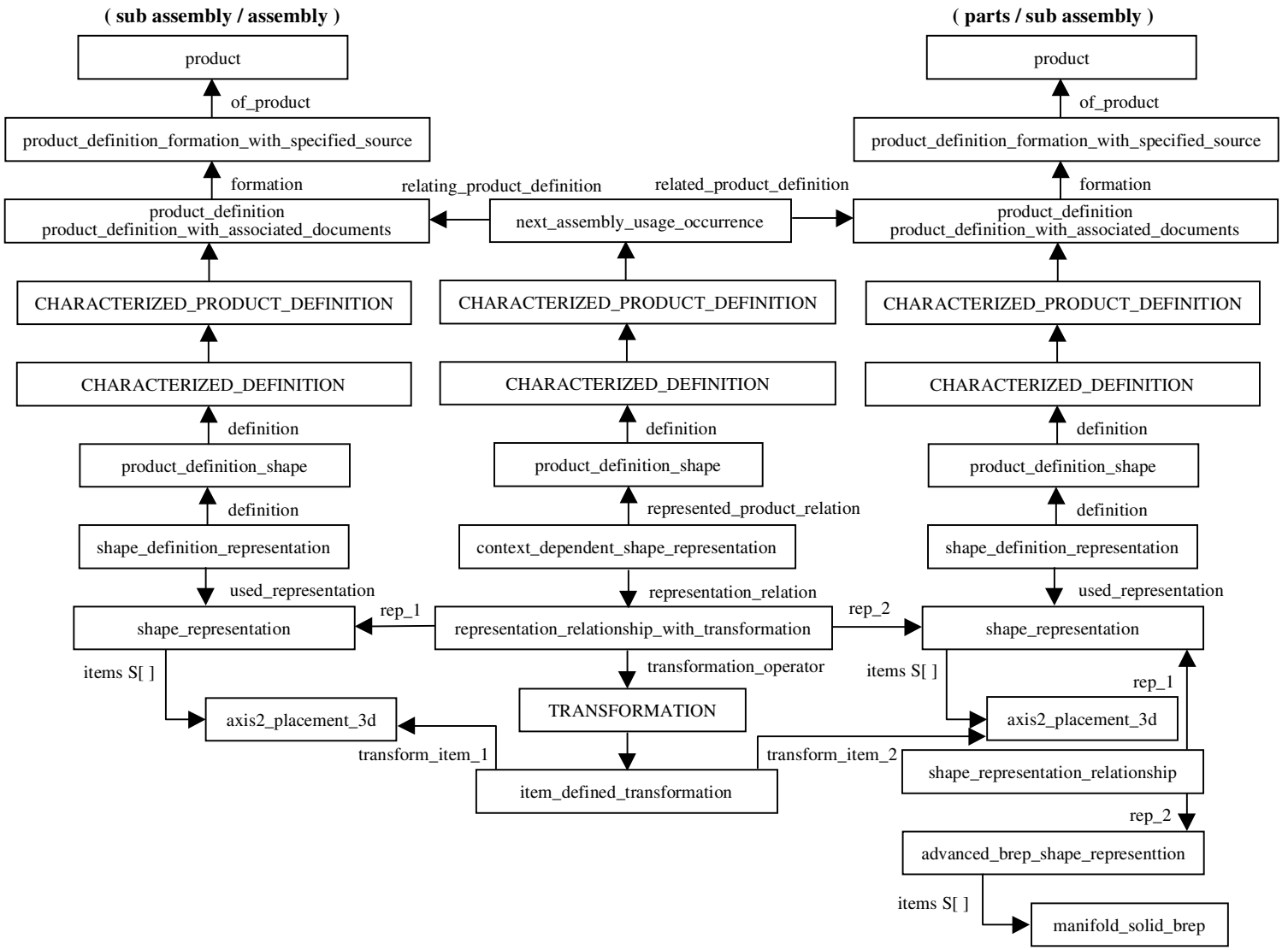

Hierarchical Relationships in Part 203

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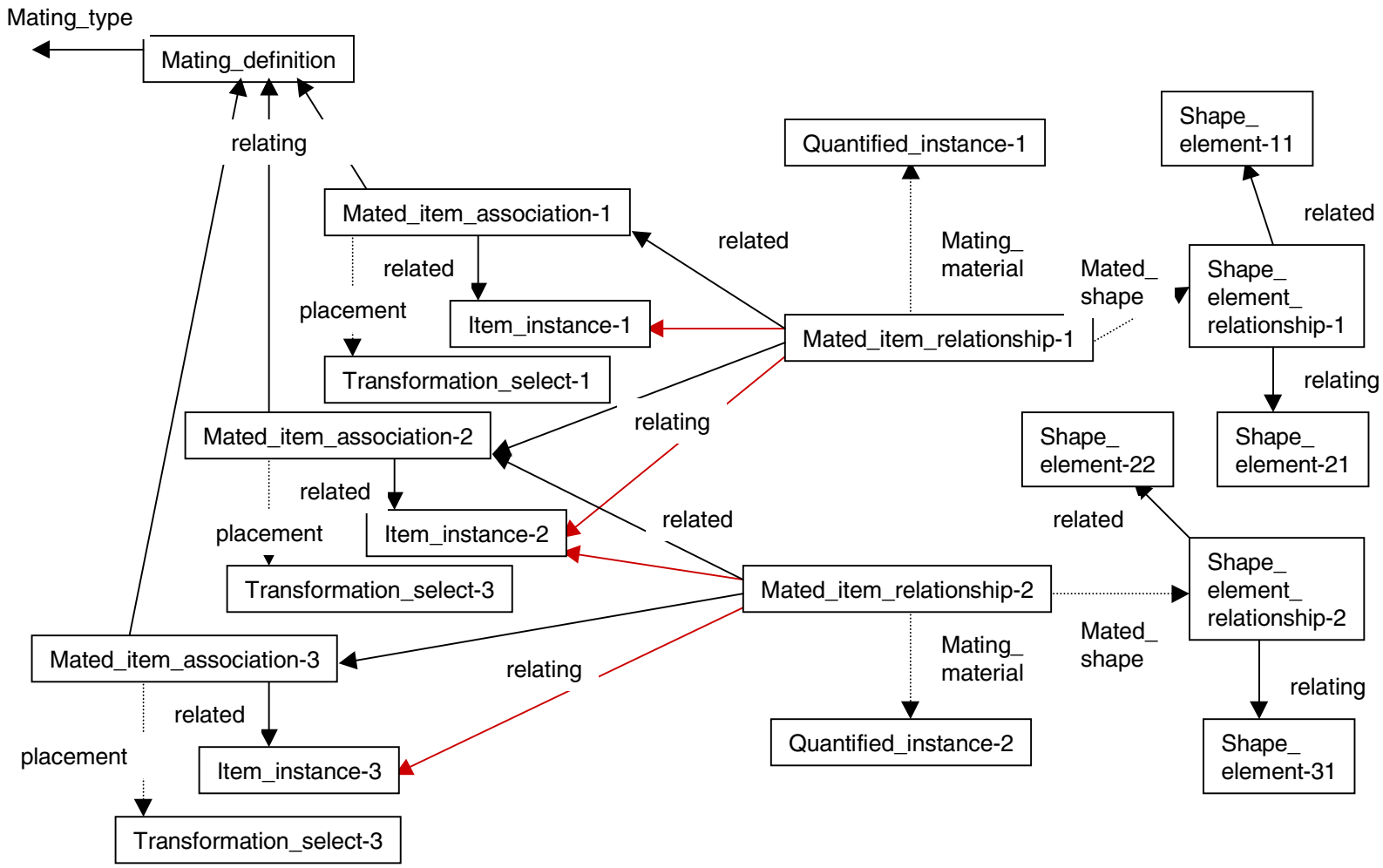

Mated Item Association in AP214

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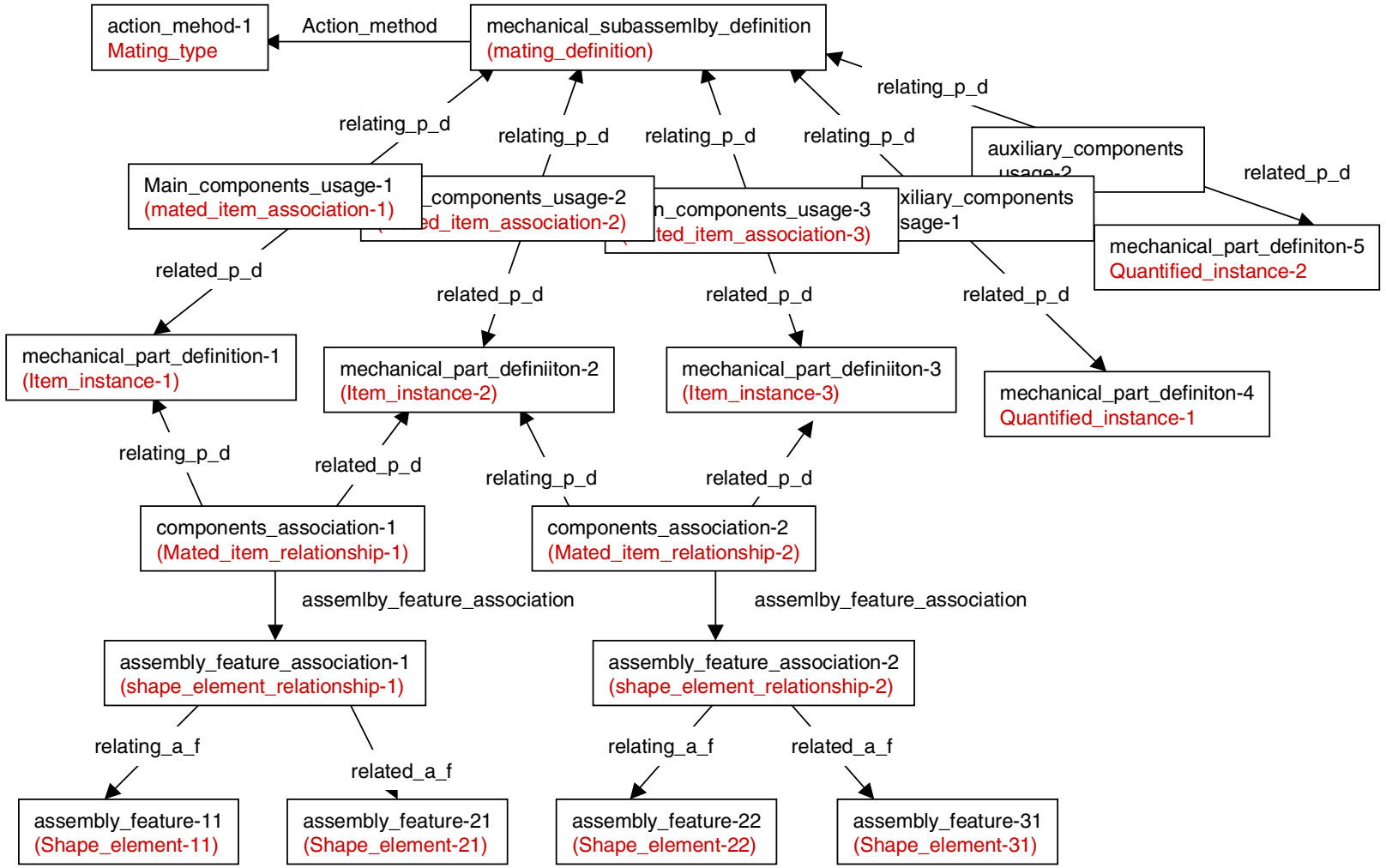

Component Association in Assembly Model

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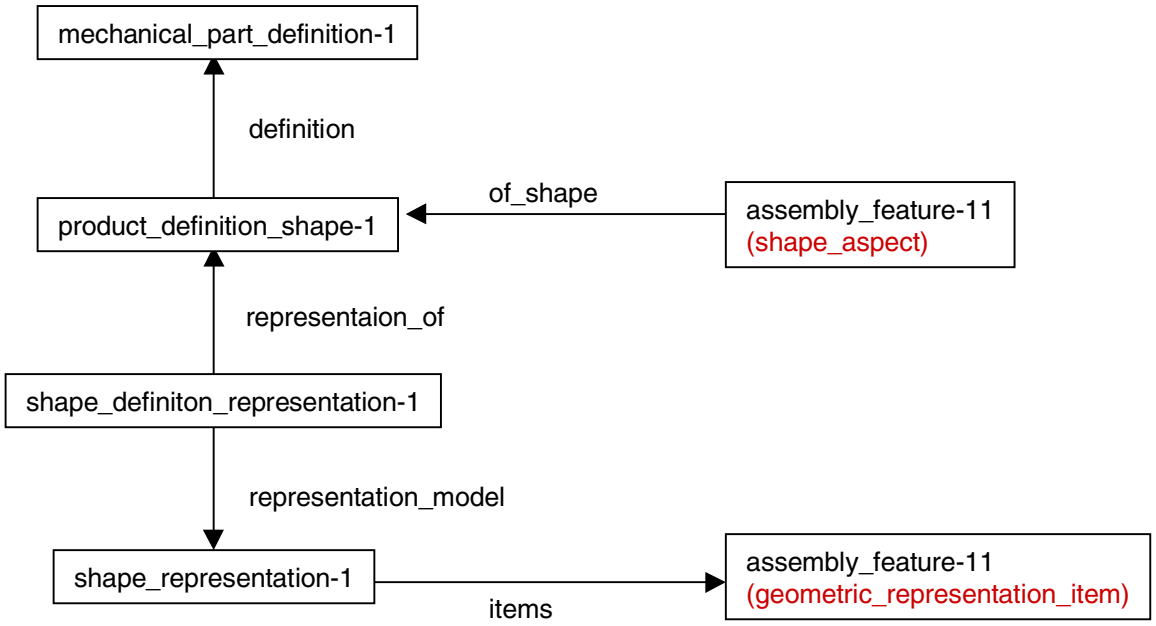

Relationship between mechanical_part_definition and assembly_features